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IN
COLUMBIA, YAKIMA, & SNAKE RIVERS

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INTRODUCTION: People in the Pacific Northwest enjoy enormous benefits from the Columbia, Snake, and Yakima Rivers systems. The Columbia River alone passes through 1,200 miles of territory starting in Canada and flowing into the Pacific Ocean at the border between Washington and Oregon states. The Snake River is just over 1,000 miles long and travels thorough the states of Idaho, Oregon and meets the Columbia River in Washington State. Many people in the area enjoy the recreational opportunities provided by the rivers in the form of boating, fishing, swimming and SCUBA diving to name a few. These rivers also provide to the farmers the necessary irrigation water for the vast crop lands on the Columbia Plateau. The Columbia River Basin is one of the most productive farm lands in the world. The rivers also provide a means to get the crops to the marketplace. Barges are routinely pushed up and down the rivers with wheat and other crops grown in the basin. Communities along the rivers are also kept safe by the flood control measures taken on these rivers. It has been estimated that only under extreme conditions could the river ever flood its banks. Electricity produced by the system of dams on these rivers provide about 70% of the energy need of the people living in and around the basin. This paper focuses on the protection of Salmon as it relates to the hydroelectric energy generation along these Rivers.

Hydroelectric generation in the northwest provides a significant amount of energy to the consumer "Through the dams--there are some 50 dams on the rivers--the Columbia Basin has been wired into one of the largest hydroelectric systems in the world. In a thinly populated area of the country, those dams supply about 70 percent of the power at a price that's about 60 percent of the national average. (Devine, Bob; The Salmon Dammed. 83).

ISSUES: The issue regarding the salmon and hydroelectric generation is complicated, emotionally charged, and far reaching in its impact on the people living within the basin as well as those outside the area. Any decisions concerning the salmon could affect other areas such as recreation, navigation, irrigation of the farm land, as well as significantly affecting the generation of electricity and the consumers.

The salmon population has steadily declined since the record year of 1911 when 49 million pounds of fish was produced. Each year thousands of salmon traveled the many miles up the Columbia and Snake Rivers to spawning grounds. Today, the numbers of fish are almost zero, "Recently the average annual run of Columbia Basin salmon has been only about 2.5 million, and about 80 percent of those fish were products of the area's hatcheries. Wild fish, which 150 years ago numbered 10 to 16 million, have dwindled to about 3 percent of that." (Devine 83).

Many factors influence the migration of the salmon. Logging disturbs the stock salmon spawning areas. The fishing industry is catching the endangered stock salmon. Cattle are destroying the shoreline of the rivers and lakes where the salmon feed. Fish raised in a hatchery compete for food and spread disease among the wild salmon. Correct and responsible reporting is also another factor in the problem of salmon migration. However, the most devastating barriers to the salmon migration is the system of dams along the Columbia and Snake Rivers. "A mania for dam building, which began in the 1930s, has reduced the Columbia and the Snake rivers to little more than a series of lakes. Of the Columbia's 581 miles between Bonneville Dam, the dam closest to the Pacific, and the Canadian border, only 50 miles still flow freely, and attempts have been made to dam that section, too." (Devine, Bob; The Salmon Dammed. 83). This has continued even though the Bonneville Power Administration (BPA) has spent vast amounts of money to facilitate the salmon migration. In a study recently done "Researchers estimate that 5 to 10 percent of salmon heading upriver die at each dam they struggle to pass." (Devine, Bob; The Salmon Dammed. 83) and "An even worse massacre occurs when the salmon young try to migrate downriver to the sea. Fish conservationists estimate that 15 to 30 percent of them perish at each dam they encounter, and most stocks must negotiate many dams. Snake River stocks, for example, are estimated to lose 75 to 95 percent of their young each year." (Devine, Bob; The Salmon Dammed. 83). Given this situation the conservationists and researchers both agree that the salmon are in danger of extinction within the next five to ten years "But even its most optimistic advocates now agree that it would take time to implement a manageable plan. "Even if we went whole hog with the drawdown right now," says DeHart, of Portland's Fish Passage Center, "it's still years away. And in the next five years we have to do something, or we won't have anything left to talk about." " (Devine, Bob; The Salmon Dammed. 88). The danger in losing the stock salmon is the adverse impact on the fishing industry, ecosystem, and salmon as a species. With no salmon there is no industry and thus a loss of jobs that affects the regional economy. With no salmon the food chain is disturbed and that could drive other species to extinction. Without stock salmon, those grown in hatcheries are genetically weaker than stock salmon and could pass on weaker genes to following fish stock.

STRATEGIES: Today, the crisis of rapid development in the Pacific Northwest Region has brought on severe environmental consequences to the region's forests and river systems. Salmon is a symbol and an important fabric of the region's long standing tradition, particularly with the Native American Tribes in the region. The cost of hydroelectric generation and its associated dam systems do not take into account the cost of environmental impacts of energy production. This is true for much of the accounting of the economic system in the United States. The economic growth -i.e., the Gross National Product (GNP) - is usually measured by the market value in current dollars of all goods and services produced by an economy for final use during a year. And to show the average individual's share of the economic pie, the economists use yet another obscure measure called GNP per capita. As with the issue of salmon species protection, virtually, the cost of externalities does not enter into any economic equations. In fact, many economists now believe that the GNP per capita numbers are poor indicators of social well-being, environmental health, even economic health. " (Miller, George T.; Living in The Environment. 1994).

Application of the System of National Accounting (SNA) principles to determine the cost/benefit of producing the hydroelectric energy over the loss of the Columbia River salmon is nonexistent. The SNA is a method of accounting that provides a means by which economists and the nation's policy makers to make macroeconomics decisions. This method, however, is very difficult to determine because of the uncertainties of determining the value of the salmon, aesthetic value of the river and the overall benefit to the people of the area.

As mentioned previously, the U.S. is the only country among the developed nations of the world, which does not calculate the cost of resource depletion and the production externalities of goods and services (e.g., social well-being, environmental health, and economic health) when determining the national product. This is a fundamental flaw and a legacy that was created very long ago. At the time of the development of the economic system natural resources seemed inexhaustible and the economist did not consider them a factor. As we are now entering the twenty-first century, the depletion of the natural resources is becoming a reality. However, our national system of economic accounting continues to operate under the past and outmoded system. Additionally, our governmental institutions are so ingrained in the older methods of determining economic growth that it is very difficult to change. "The SNA provides a more comprehensive, integrated picture of the economy than the present U.S. economic accounting system. In particular, it would integrate the recording of the economy's stocks and flows, both financial and nonfinancial. Thus it would provide a better analytical base for policy. Most developed countries follow the SNA, adapting it to fit their economies and statistical systems. Were the U.S. to adapt the SNA, U.S. measures of economic growth, inflation, the saving rate, and other key policy variables would be more comparable with those from other countries." (Carson and Honsa 20).

Miller summarizes the inherent problems associated with the current system of national economy in four major areas: (1) It hides the negative impact on humans and the rest of the ecosphere of producing many goods and services; (2) It takes no account of depletion and degradation of natural resources, upon which all economies ultimately depend; (3) It underestimate some positive effects on society; and (4) It tells us nothing about economic justice such as how resources, income, or the harmful effects of economic growth (pollution, waste dumps, land degradation are distributed among people in an economic system.

There are over 30 dams operated by the Corps of Engineers and Bureau of Reclamation reported on by the Bonneville Power Administration (BPA). These dams have a generating capacity of 22,234 megawatts (MW). However, last year was the first in a decade that the BPA asked for a rate increase greater than 10% "11.6 % for 1994 and 1995" (BPA 1993 Annual Report 6). Additionally, over the fiscal year 1993 the BPA spent more on electricity from outside sources than it took in revenues by \$297 million. Several factors contribute to this imbalance. However, a significant element was the generating capacity lost due to the drawdowns on the river so the salmon could migrate, "And as a result of the Endangered Species Act, much of the good spring rainfall that might have been stored for fall was released early to provide faster flows for fish" (BPA 1993 Annual Report 16).

When the salmon migrate downstream to the sea, "Fish conservationists estimate that 15 to 30 percent of them perish at each dam they encounter, and most stocks must negotiate many dams. Snake River stocks, for example, are estimated to lose 75 to 95 percent of their young each year." (Devine 83).

This has led some of the public utilities to explore other forms of energy production based on the price alone. Other problems have created increased prices for the consumer. The use of irrigation water in Washington and Oregon in a practice of "Spreading Water" (Blumenthal) over the past several years has caused needless withdrawals from the river. The water, which might otherwise be used for electrical generation or in assisting salmon migration is used for farming purposes. "While making clear he nor anyone else knows how much water might be returned to rivers and streams if the unauthorized irrigation was halted, Miller and others suggested it could potentially provide a boost to the effort to restore salmon runs in the Northwest." (Blumenthal 1) The sale of electricity outside the northwest region is significant in terms of energy sales (MWH) and revenue. Without significant modification in the way the BPA conducts business, the consumer could be the real loser on two counts: (1) the loss of the salmon; and (2) loss of cheap hydroelectricity.

The impact on consumers comes in the form of increased rates to cover the loss of revenue on the part of the Power Administration. The BPA is altering the rate schedules to meet the demands of the consumer. Plus, they are offering other services to the users in order to make their power more appealing. However, BPA is having difficulties in competing with other forms of energy production. The Benton County Public Utilities District for instance, is considering purchasing electricity produced by gas turbines. The price of this energy from a gas turbine is within a penny of that produced by a hydroelectric turbine. Determination of the cost/benefit of the salmon run and energy production has not been easy largely because of the emotional effects of knowing that the salmon may go extinct in the near future. However, using the principles of the System of National Accounting provides a means to connect national products with natural resources.

"The aim of national accounting is to provide an information framework suitable for analyzing the performance of a country's economic system." (Repetto 13). The SNA was first developed in 1953 by the United Nations Statistical Commission. One of the shortcomings of the earlier versions was the lack of consideration for natural resources "The SNA is criticized because Gross Domestic Product (GDP), as now measured, is seen as flawed in the way it treats environmental protection costs and the degradation of natural resources" (Carson and Honsa 30). With the revisions of 1968 and 1993, the U.S. has approved the SNA and will begin making adjustments in the economic systems.

The two main goals of the SNA are; 1) make comparisons between countries easier. 2) Serve as a guide to countries as they develop their economic systems. In order to meet the goals, the SNA must measure all of the transactions that take place in the economy. Because there is no national consensus on quantifying the use of natural resources, it is very difficult to put a price tag on the aesthetic value of the mountains, old growth forests, or the salmon runs. One of the problems is what price to attach to the fish. Aggregating fish would obscure the purpose of protecting a particular species from extinction. This still presents a

significant problem for the natural resources economists. There are guidelines provided by the United Nations and Organization of the Economic Co-operation and Development for determining the value of a resource. "The United Nations recommends that countries create balance sheet accounts that include certain natural resources, such as tree plantations, and nonrenewable resources, such as agricultural land and subsoil minerals, along with financial assets and stocks of capital goods." (Repetto 14).

Traditional methods primarily focus on the production of goods and services without any consideration given to the consumption of resources. As resources were used, the manufacturer would buy more. The only limit placed on resources was the cost of getting more. With the heightened knowledge of environmental costs and ultimately the added cost of production, the producers would be forced to consider depletion of resources and other environmental factors in their business decisions. In market based economies, this would force decision makers/producers to make decisions relevant to a sustainable economy. The considerations for a sustainable economy are valuable for the developed as well as the developing nations of the world. In addition it would require the decision makers to examine the means by which a product is made.

Potential benefits of having a salmon species are enormous. Without the stock salmon, there would be no sustainable fishing industry. This means there would be thousands of people whose jobs would be dislocated not only on the fishing boats but also in canneries and other related jobs. The recreational sport fishing industry would also suffer from the depletion of this vital natural resource. There would be less biodiversity and a disruption of the food chain. Stock salmon are more able to withstand the long migrations and life in the ocean, while hatchery grown salmon are genetically inferior. "Hatchery-bred fish spread disease among wild stocks and compete with them for food, but what worries biologists mostly is the damage hatchery fish do to the gene pool. These salmon are adapted to life in concrete raceways, not to the rough-and-tumble of streams and rivers. When they interbreed with wild fish, they spread their deficiencies." (Devine 83).

The impact on the hydroelectric development in the northwest cannot be quantified with respect to the amount of water diverted for irrigation, number of additional dams constructed, or people using the rivers. This is principally due to the lack of knowledge concerning the threshold of effects before irreversible damage. However, a reasonable determination of the effects can be provided if further development along the rivers is reduced. Reducing the waste due to inefficient irrigation methods could enhance and increase the flows sufficient to restore salmon migration. With better management of the river water, more electricity could be produced with less disruption of the flow. Fewer sales outside the northwest to all except those services provided by international agreements could reduce the total energy sales and reduce the energy requirements significantly. Lastly, all of these measures cannot be accomplished without a rate increase. The present rates are not commensurate with the actual cost of energy production with respect to the cost of externalities. Presently, any rate hike would be very hard to institute, but some of the increases could be offset by an increase in federal appropriations and low interest loans. These funds could be used to improve the technology and upgrade the dams. Each year the BPA is appropriated million of dollars to replace and improve the existing generating

facilities. This money could be used to develop other sources of energy. Smaller hydroelectric dams the interfere with the river less. Solar power generation could also be developed along with wind power.

Other expedient and temporary solutions to the depletable salmon population have been put forth. Opening the spillways has had limited success. The salmon die of nitrogen saturation after going over the dam. Also, the time required for the salmon to migrate past all of the dams takes about 30 days. This exceeds the time frame for physiological changes to occur in the salmon by 10 days leading to their death and loss of migratory instinct. The most recent plan has been to transport them by truck, barge, and rail past the dams to the mouth of the river. This plan is opposed by conservationists and Indian representatives as unacceptable because it is not a long term corrective action. It involves the passage of the salmon through an intricate maze of tunnels, gates and valves that end up in a truck, train or barge. Although it can be a short term solution to the problem, its long term affects are unknown.

CONCLUSION: Having a sustainable salmon fishing industry without giving up the hydroelectric generation is an attainable goal. However, there are concessions to be made on both sides of the issue. One of the first steps is to determine the value of the salmon, using the System of National Accounting, so that this factor is incorporated into the project decision making and ultimately into the cost of energy production. The potential costs to the consumer will be enormous if the wild salmon stock become extinct. Loss of an industry, both sport and commercial fishing, would mean more unemployment and loss of revenues. It will also mean an increased electrical rate for the people in the region. The consumers would invariably lose enjoyment and other recreational values associated with the annual salmon runs. The SNA would provide a means to analyze the costs and benefits of further development of the river systems. The measure necessary to save the salmon and maintain the hydroelectric power are:

- Accelerate the use of the System of National Accounting.
- Create the river flow suitable for migrating salmon.
- Reduce the inefficient water usage.
- Improve the design of the dams to include smaller dams.
- Reduce the amount of electricity generated for sale outside the northwest (excluding international agreements).
- Increase the federal appropriations for construction and replacement of dams.
- Increase electrical rates to the national average to help pay for conservation measures.
- Incorporate the use of alternate energy sources to supplement the increasing demand for hydroelectric generation.

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